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(54) Title of the Invention: Backsheet for Absorbent Article

(57) [Abstract]

[PROBLEM]

To provide an absorbent article enabling visual confirmation of the presence or absence of urine and enabling suppression of a printed surface area.

[RESOLUTION MEANS]

A top sheet 2, a liquid-impermeable and moisture-permeable back sheet 3, and a liquid-retaining absorbent body 4 disposed between these sheets are provided. The contact surface of the backsheet 3 with the skin is provided with a water-insoluble printed section 31 printed with water-insoluble ink and a water-soluble printed section 32 printed with water-soluble ink. A part or the whole of the water-insoluble printed section 31 is covered by the water-soluble printed section 32.

[Selected Diagram] FIG. 1

[Scope of the Patent Claims]

[Claim 1]

A liquid-impermeable and moisture-permeable backsheet for an absorbent article has a water-insoluble printed section printed with water-insoluble ink and a water-soluble printed section printed with water-soluble ink, wherein

a part or the whole of the water-insoluble printed section is covered by the water-soluble printed section.

[Claim 2]

The backsheet for an absorbent article according to claim 1, wherein the water-soluble printed section and the section covered by the water-soluble printed section in the water-insoluble printed section are printed with different letters, symbols or designs.

[Claim 3]

The backsheet for an absorbent article according to claim 1 or claim 2, wherein the water-soluble printed section and the section covered by the water-soluble printed section in the water-insoluble printed section are of different colors.

[Claim 4]

An absorbent article provided with a top sheet, a backsheet according to any one of claims 1 - 3 and a liquid-retaining absorbent body disposed between the sheets.

[Claim 5]

The absorbent article according to claim 4, wherein the water-soluble printed section is provided on the contact surface with the skin.

[Detailed Description of the Invention]

[0001]

[Technical Field of the Invention]

The present invention relates to a backsheet having letters, symbols or designs (hereinafter also called designs and the like) printed on said backsheet, and to an absorbent article using the same.

[0002]

[Conventional Technology and Problems to be Solved by the Invention]

A known technique is disclosed, for example, in Japanese Patent Application Publication No. S59-24704 as a conventional technique related to an absorbent article such as a disposable diaper in which the presence or absence of urine can be visually determined from the outside.

[0003]

This technique is such that patterns or the like are provided separately into sections that change color, develop color and lose color and sections that do not change color, develop color or lose color when in the presence of water on a backsheet of a disposable diaper. The change in color of the design or the like before and after the application of urine enables the confirmation of the presence or absence of urine.

[0004]

However, when providing a pattern or the like separated into a section that loses color in contact with water and a section that does not on a backsheet of a disposable diaper, not only the change in color due to the loss of a section of ink forming the pattern or the like before and after excretion of urine, but also the recognition that urine has been excreted based on the change in the surface area of a section such as a pattern, which causes the loss of a part of the pattern due to the excretion of urine. Using the conventional technique, when a pattern or the like is provided that is separated into a section that loses color in contact with water and a section that does not, in comparison to the pattern or the like before the excretion of urine, the surface area of the pattern or the like after the excretion of urine is necessarily made smaller and thus creates a weak impact before and after excretion of urine. Furthermore, when this type of disposable diaper is provided with a pattern or the like that is separated into a section that loses color in contact with water and a section that does not, the printed surface area of the pattern or the like must necessarily be increased, and there is the risk of impediment to the moisture permeable qualities of the backsheet.

[0005]

Thus, it is an object of the present invention to provide a backsheet for an

absorbent article enabling control of the printed surface area and enabling visual confirmation giving a strong impact with respect to the presence or absence of urine excretion and to an absorbent article using this backsheet.

[0006]

[Means to Solve the Problem]

The present invention realizes the above object by providing a backsheet for an absorbent article having a water-insoluble printed section printed with water-insoluble ink and a water-soluble printed section printed with water-soluble ink and that is liquid impermeable but moisture permeable, moreover a part or the whole of the water-insoluble printed section is covered by the water-soluble printed section.

[0007]

When a section covered by the water-soluble printed section in the water-insoluble printed section and the water-soluble printed section are printed with different designs or the like, the impact is stronger before and after the change in the pattern printed on the water-insoluble printed section from the pattern or the like printed on the water-soluble section before and after urine excretion.

[0008]

It is possible to realize an intermediate color in the covering section to that of the water-soluble printed section and the water-insoluble printed section by covering a section or the whole of the water-insoluble printed section with a water-soluble printed section having a color that is different to the color of the water-insoluble printed section. The covering section changes to the color of the water-insoluble printed section from the intermediate color of the water-soluble printed section and the water-insoluble printed section before and after urine excretion thereby enabling a stronger impact before and after urine excretion.

[0009]

This invention attains the above object by providing an absorbent article provided with a top sheet, a backsheet for the absorbent article of the present invention, and a moisture retaining absorbent body disposed between the sheets.

[0010]

[Description of the Preferred Embodiment]

The invention will be described below based on the preferred embodiments making reference to the attached figures.

[0011]

Fig. 1 to Fig. 3 shows a first embodiment applying the absorbent article of the present invention to a pants-type disposable diaper. In the figures, reference numeral 1

denotes a pants-type disposable diaper (hereafter simply referred to as "disposable diaper").

[0012]

As shown in the above figures, a disposable diaper 1 has an absorbent body 5 that has a liquid-permeable topsheet 2, a liquid-impermeable and moisture permeable backsheets 3 and a liquid retaining absorbent body 4 disposed between the sheets 2, 3. The absorbent body 5 is attached and fixed to an outer sheet 6 disposed to cover an outer face of the back sheet 3.

[0013]

A water-insoluble printed section 31 printed in various colors in a water-insoluble ink and a water-soluble printed section 32 printed in various colors in a water-soluble ink are provided at least in proximity to the urine excretion spot on the abutment face with the skin of the backsheets 3. A section of the water-insoluble printed section 31 is covered by water-soluble printed section 32. Thus, the water-soluble printed section 32 is positioned next to the skin.

[0014]

In the present embodiment, as shown in Fig. 3(b), the water-insoluble printed section 31 is provided with a pattern of a crying face character, tears or musical notes. Furthermore as shown in Fig. 3(a), the water-soluble printed section 32 is provided with a pattern of the character above with a laughing face, stars or musical notes. To describe in further detail, the water-soluble printed section 32 has a printed pattern of the eyes of a laughing face on top of a pattern of the eyes of a crying face and a partially laminated printed pattern in which the mouth of a laughing face is partially on top of a pattern of the mouth of a crying face. Furthermore a pattern of stars is partially printed on top of the tear pattern above.

[0015]

Furthermore the water-soluble printed section 32 having a pattern of musical notes is printed in a different color to the water-insoluble printed section 31 in order to cover the whole of the musical note pattern of the water-insoluble printed section 31.

[0016]

In the water-insoluble printed section and the water-soluble printed section, it is preferred that the L^* , C^* , and h^* values, which are parameters related to a color coordinate system, are such that the L^* value related to brightness and the C^* value expressing color saturation are within a predetermined range.

[0017]

The water-insoluble printed section and the water-soluble printed section

preferably have an L^* value expressing brightness of 30 - 90, and more preferably 35 - 90, and still more preferably 40 - 90. The water-insoluble printed section and the water-soluble printed section preferably have an C^* value expressing color saturation of at least 10, and more preferably at least 15 and still more preferably at least 20. In particular, when a section of at least 25% and in particular, at least 50% of the entire surface area of the section provided with the water-insoluble printed section and the water-soluble printed section in the backsheet 3 satisfies the range for the L^* value and the C^* value, the pattern or the like can be clearly seen even when covered by the backsheet 3 and the outer sheet 6 (this value is termed the surface area ratio). The surface area ratio is most preferably 100%. When the L^* value and the C^* value are too low, the color is too dark and the meaning of the various colors is lost. When the L^* value is too high, the pattern, which is seen through the backsheet 3 and the outer sheet 6, is not sharp and not acceptable to consumers.

[0018]

The water-insoluble printed section 31 and a water-soluble printed section 32 are such that the variation in the pattern or the like is large around the time of urine excretion, and therefore in order to create a large impact on the viewer, the color saturation and brightness are preferably different. The difference in brightness of the water-insoluble printed section 31 and the water-soluble printed section 32 (L^* value of water-soluble printed section - L^* value of water-insoluble printed section) is preferably at least 10 and more preferably at least 15. Furthermore, the difference in color saturation of the water-insoluble printed section 31 and the water-soluble printed section 32 (C^* value of water-soluble printed section - C^* value of water-insoluble printed section) is preferably at least 5 and more preferably at least 10.

[0019]

As shown in the pattern in Fig. 3, when a section or the whole of the water-insoluble printed section is covered by a water-soluble printed section having a different color to the water-insoluble printed section, to increase the change in the pattern before and after urine excretion and create a larger impact on the viewer, in particular, it is preferred to provide a prescribed color difference ΔE^* of the color in the section covered by the water-soluble printed section in the water-insoluble printed section (the color when the section covered in the water-insoluble printed section by the water-soluble printed section is viewed approximately from above is hereafter termed an intermediate color) and the color of the water-insoluble printed section. The color difference ΔE^*_{ab} is preferably at least 10, more preferably at least 15, and still more preferably at least 20. Herein, in the color difference formula for uniform color spaces,

the color difference ΔE^*_{ab} is a value expressing the perception difference of the color given by the color difference formula for a Cube-Root space. The color difference ΔE^*_{ab} is expressed by the color difference formula (Equation 1) below by a difference ΔL^* for a brightness index L^* for two object colors in an $L^*a^*b^*$ coordinate color system (CIE1976) and a difference Δa^* and a difference Δb^* of equation coordinates a^* and b^* .

$$\Delta E^*_{ab}=[(\Delta L^*)^2+(\Delta a^*)^2+(\Delta b^*)^2]^{1/2} \dots\dots \text{(Formula 1)}$$

[0020]

Examples are such that a part or the whole of the water-insoluble printed section is covered by the water-soluble printed section that has a color that is different to the water-insoluble printed section and the covering section has an intermediate color include a purple color resulting from a combination of a magenta water-insoluble printed section and a cyan blue water-soluble printed section, a purple color resulting from a combination of a cyan blue water-insoluble printed section and a magenta water-soluble printed section, a green color resulting from a combination of a cyan blue water-insoluble printed section and a yellow water-soluble printed section, a green color resulting from a combination of a yellow water-insoluble printed section and a cyan water-soluble printed section, an orange color resulting from a combination of a magenta water-insoluble printed section and a yellow water-soluble printed section and an orange color resulting from a combination of a yellow water-insoluble printed section and a magenta water-soluble printed section.

[0021]

The section having an intermediate color, which is formed by a section or the whole of the water-insoluble printed section covered by a water-soluble printed section having a color that is different to the color of the water-insoluble printed section, must be more clear than the variation in the color in order to produce a large change in the design or the like before and after urine excretion and give a large impact to a viewer. Thus it is preferred that the color of the water-soluble printed section and the water-insoluble printed section should have as large a color difference as is possible. However, if the water-soluble printed section and the water-insoluble printed section superimpose colors have an extremely large color difference, conversely the brightness of the covering section and the section of the intermediate color is reduced and the color of the covering section seen from the outside of the diaper tends not to be sharp. This type of lack of sharpness can be avoided for example by printing the water-insoluble printed section in a dotted shape, a striped shape or a lattice shape and providing a covering section by printing the water-soluble printed section in a dotted shape, striped

shape or lattice shape so that a section of the whole of the water-insoluble printed section is covered.

[0022]

When providing a covering section on the moisture permeable sheet and the covering section has an intermediate color covering a section or the whole of the water-insoluble printed section with a water-soluble printed section having a color different to the color of the water-insoluble printed section, the water soluble ink components dissolved by urine seep through small holes in the moisture permeable sheet and accumulate in an inner section of the moisture permeable sheet. Thus, the color of the pattern or the like about excretion of urine is not sharp. This type of lack of sharpness can be avoided by blocking the small holes in the moisture permeable sheet to a certain extent using the water-insoluble printed section. In this case, the covering section is preferably formed from a water-insoluble printed section printed in a dotted shape, striped shape, or lattice shape having 30 - 100% of the surface area be the covering section and a water-soluble printed section printed in a dotted shape, striped shape or lattice shape and having 10 - 80% of the surface area be the covering section.

[0023]

The L*value, C* value and color difference ΔE^*_{ab} is measured using a color difference meter. In the present invention, the reflected light was measured and calculated with a plurality of backsheets (not printed) laminated on a back side of a measurement sample to have a thickness of at least 5 mm. Measurements were performed using a portable dispersion color difference meter NF777 (tradename) manufactured by Nihon Denshiki Co., Ltd. under measurement conditions of illumination condition C, view angle condition 2°, illumination light reception condition 0.45° and flux diameter $\phi 10\text{mm}$.

[0024]

Water-insoluble inks used in the water-insoluble printed section include nitrocellulose ink, polyamide ink, acrylic ink, dye ink and the like.

[0025]

Water-soluble inks used in the water-soluble printed section include maleic acid resin ink, acrylic water-based ink and the like.

[0026]

It is preferred to use a material having liquid impermeable properties and moisture permeable properties as the material for the backsheet 3. The level of moisture in this case is preferably 0.5 - 4.0 g/(100cm²·hr) which is a value depending on the test material after storage for one hour at 32°C with reference to JIS Z0208 from the point

of view of preventing leakage of bodily fluids due to the pin holes in the sheet and to obtain a suitable sensation due to suitable moisture adjustment in the diaper.

[0027]

Materials used in a backsheet 3 having such liquid impermeable and moisture permeable properties include a film formed by fusing and kneading a hydrophobic thermoplastic resin and calcium carbonate to make a microscope inorganic filler or an incompatible organic polymer and subjecting the film to uniaxial or biaxial stretching to form a porous film. An example of a thermoplastic resin includes polyolefin. Polyolefin includes high to low density polyethylene, linear low density polyethylene, polypropylene and polybutene. These substances may be used singly or in combination.

[0028]

The material used in the backsheet 3 is preferably a material having a predetermined light transmission rate so that the water-insoluble printed section and the water-soluble printed section are visible to the outside. The light transmission rate of the material used in the backsheet 3 is preferably 30 - 80%, more preferably 35 - 80%, and still more preferably 40 - 80%. When the light transmission rate is less than 30%, even when the L* value and the C* value are within the predetermined range, the sharpness of the pattern seen through the backsheet 3 and the outer sheet 6 is adversely affected and the acceptance of the diaper by consumers is adversely affected. On the other hand, when the light transmission rate is more than 80%, the excreted material is visible from the outside and since the pattern is seen superimposed on the excreted material from the outside of the diaper, the change in color or pattern or the like is not sharp.

[0029]

The light transmission rate was measured using a reflection and transmittance meter (manufactured by Murakami Shikisai Kenkyusho, Tradename "HR-100"). Measurement was performed using an A light source and a total light transmission ratio of T_t . 10 arbitrary points on a sample were measured, the measured values were averaged to obtain a light transmission ratio.

[0030]

The basis weight of the backsheet 3 is 10 - 40 g/cm² from the point of view of maintaining sufficient strength and obtaining a soft sensation. In particular a value of 15 - 35 g/cm² is preferred.

[0031]

The section without printing on the backsheet 3, in other words, the ground color section, displays a tendency to become yellow over time when stored due to the action of light and heat. When the ground color section becomes yellow, there is an

adverse effect on the sharpness of the printed pattern or the like. In order to prevent this from occurring, before printing, it is desirable that the b^* value (color coordinate index in an $L^*a^*b^*$ color coordinate system (CIE1976)) for the ground color section be placed at a value between 0 and a negative value to obtain a slightly bluish color. The b^* value is preferably between -5 and 0. The b^* value is measured in the same manner as the L^* value and the ΔE^*_{ab} value.

[0032]

The absorbent body 4 can be used without particular limitation on its use as a normal object used in this type of absorbent article, such as a disposable diaper or sanitary napkin. In the present embodiment, the absorbent body 4 is mainly composed of a mixed material such as water absorbent polymer and fibrillated pulp and mounting paper to enclose the material. Furthermore, in the present embodiment the disposable diaper 1 has a stretchable gather 51 disposing rubber 50 in an inner section on both sides. The outer sheet 6 has a waist section 62 and a leg section 63 provided with a stretchable gather disposing rubber 60, 61 on an inner section of a double layer non-woven fabric.

[0033]

It is preferred that a material having a predetermined light transmission rate is used in the outer sheet 6 so that the water-insoluble printed section and the water-soluble printed section can be seen from the outside. It is preferred that the outer sheet 6 has a light transmission rate of at least 50%, more preferably at least 55% and still more preferably at least 60%. When the light transmission rate is less than 50%, even when the L^* value is within the predetermined range, the sharpness of the pattern seen through the backsheet 3 and the outer sheet 6 is adversely affected and the acceptance of the diaper by consumers is adversely affected. The light transmission rate of the outer sheet 6 is measured in the same manner as the backsheet 3.

[0034]

It is preferred that the outer sheet 6 includes a non-woven fabric with a basis weight and a thickness such that a light transmission rate is obtained that enables the water-insoluble printed section and the water-soluble printed section to be seen from the outside. The non-woven fabric preferably has a basis weight of 5 - 45 g/m² from the point of view of allowing the printed section to be seen sharply and not to affect the sensation and skin contact feeling of the fabric adversely, and in particular it is preferred to be 10-40 g/m².

[0035]

Furthermore the non-woven fabric used in the outer sheet 6 (the thickness of

one sheet of the non-woven fabric) preferably has a thickness of 0.1 - 3.0 mm due to the same considerations as those described above, with 0.2 - 2.0 mm being particularly preferred. The thickness of the non-woven fabric is the thickness when spread flat on a base immediately prior to lamination with the backsheet 3 and placed on a square plate (weight 50g) having sides of 120 mm.

[0036]

The non-woven fabric used in the outer sheet 6 includes polyolefins such as polyethylene or polypropylene, polyesters such as polyethylene terephthalate, fibers composed of a single thermoplastic resin such as polyamide, or composite fibers having a core-sheath structure or a side-by-side structure using two or more types of the above fibers. The non-woven fabric is preferably manufactured using a general manufacturing method such as an air-through method, a melt blow method, a heat seal method, spun bond method, and a suction heat bond method.

[0037]

It is preferred that the non-woven fabric used in the outer sheet 6 has a ground color of white or is an extremely light color. However, it may be colored within a range in which the sharpness of the water-insoluble printed section and the water-soluble printed section and the external appearance of the diaper is not adversely affected.

[0038]

The disposable diaper 1 in the present embodiment displays a laughing face character through the outer sheet 6 prior to the excretion of urine. After urine excretion, when the water-soluble ink dissolves in the urine, the color of the section having musical notes in the water-insoluble printed section 31 that is covered by the water-soluble printed section 32 undergoes a change and the pattern of stars and the character is changed to tears and a character having a crying face.

[0039]

The water-insoluble printed section 31 and the water-soluble printed section 32 may be provided in proximity to the urine excretion point in the disposable diaper (the central section of the groin section of the diaper and slightly more towards the abdomen). However, when urine is discharged with force when sleeping with the diaper attached, there is sometimes leakage of urine toward the open section around the torso of the diaper. In order to promptly advise a viewer of the point reached by the urine in this case, as shown in Fig. 2, the water-insoluble printed section 31 and the water-soluble printed section 32 are preferably provided in the abdominal side section and the back section.

[0040]

Next a method of manufacturing a disposable diaper 1 will be described making reference to Fig. 4.

[0041]

Fig. 4 is a schematic view showing a section of the manufacturing process for a disposable diaper. In the present embodiment, firstly, a backsheet 3 is supplied continuously from a roll 30. A printing device 7 using water-insoluble ink is used to print water-insoluble printed section 31 including a pattern having a character, tears, and musical notes (refer to Fig. 3(b)) on the skin abutting side of the backsheet 3.

[0042]

It is preferred that the supply speed of the backsheet is a speed enabling clear printing without smudging. Furthermore in the present embodiment, since printing is performed on the skin abutting face of the backsheet 3, the printed pattern is printed in an inverted manner. Herein, the method of printing may include a normal printing method conventionally used for this type of printing. The printing methods include, for example, flexo printing, gravure printing, inkjet printing, screen printing and bubble jet printing (registered trademark) and the like.

[0043]

Next, the water-soluble printed section 32 is provided by printing over a section of the water-insoluble printed section 31 with a pattern (refer to Fig. 3(a)) of a character with a laughing face, stars and musical notes using a printing device 8 with water-soluble ink in order to cover the pattern with the exception of a section of the mouth and the outline of the character that is the pattern of the water-insoluble printed section. The water-soluble printed section 32 can be printed using the same method of printing as that for the water-insoluble printed section 31.

[0044]

Next, the backsheet 3 attached to the water-insoluble printed section 31 and the water-soluble printed section 32 enters the supply line continuously or intermittently supplying the absorbent body 4. The manufacturing process for the absorbent body 4 can employ a manufacturing process for a normal absorbent body in this type of absorbent article.

[0045]

Next, liquid permeable top sheet 2 is supplied either continuously or intermittently from above the absorbent body 4 from a roller 20 and positioned in the supply line. The outer sheet 6 is supplied continuously or intermittently from the roll 64, a hot melt 30 is coated using a coating device 9 and the resulting article is supplied to

the outer face of the backsheet 3. The outer sheet 6 is supplied continuously or intermittently from the roll 64, a hot melt 30 is coated using a coating device 9 and the resulting article is supplied to the outer face of the backsheet 3. The outer sheet 6 and the backsheet 3 are attached, transferred to a cutting process and cut into a predetermined dimensions and shapes. It is possible to use a normal process used in the manufacturing methods for this type of absorbent body for the disposition step of the top sheet 2 of the absorbent body 4, the attachment step of the outer sheet 6 and the backsheet, and the cutting step.

[0046]

As described above, according to the disposable diaper 1 of the present invention, since the water-soluble printed section 32 having a different pattern or the like printed using water-soluble ink is provided so as to cover a section of the water-insoluble printed section 31 and the water-insoluble printed section 31 is provided using water-insoluble ink on the skin abutting side of the backsheet 3, it is possible to change the pattern in addition to the color before and after urine excretion. Furthermore it is possible to create a large impact on the viewer and to enable the external visual confirmation of the presence or absence of urine. Furthermore, since the water-insoluble printed section 31 is printed to cover the water-soluble printed section 32, the printed surface area can be small, and to that degree does not adversely affect the moisture permeating properties of the backsheet 3.

[0047]

The present invention is not limited to the above aspects and may be suitably varied without departing from the spirit of the invention.

[0048]

For example, as with the aforementioned embodiments, although covering a section of the water-insoluble printed section with the water-soluble printed section, the entire section of the water-insoluble printed section may be covered by a water-soluble printed section having a different pattern or letters.

[0049]

Furthermore, the present invention, as described in the above aspects, preferably provides a water-insoluble printed section and water-soluble printed section on the skin abutting side of the backsheet. However, it is possible to provide the water-insoluble printed section only on the side not abutting with the skin or on the side not abutting with the skin and the side abutting with the skin, and to provide the water-soluble printed section on the side abutting with the skin.

[0050]

Furthermore, the present invention as described in the above aspects, is particularly suitable for a disposable diaper and the manufacture of the same. However the present invention can be applied to other absorbent articles such as sanitary napkins provided with an absorbent layer composed of an absorbent body having liquid retention properties in which the absorbent body and the moisture permeable top sheet are formed substantially integrally.

[051]

(Embodiments)

The present invention will be described in further detail below making reference to the embodiments.

[0052]

A disposable diaper was prepared as shown in Embodiment 1 and Embodiment 2 and Comparative Example 1 and the evaluation described below was performed. The results are shown in Table 1.

[0053]

(Embodiment 1)

(1) Manufacture of the Backsheet

10 parts by weight of an ester (plastic: stearic acid: trimethylolpropane: adipic acid = 4:2:1) was added to 150 parts by weight of surface-processed calcium carbonate (average particle radius :1 μ m), and 100 parts by weight of linear low-density polyethylene (ULT-ZEX 2520F, Mitsui Chemicals) and mixed in a kneading machine using two impellers to prepare a pellet. The resulting pellet was supplied to an inflation molding machine to form an inflation sheet having a thickness of 40 μ m. A roll drawing machine was used to draw the resulting sheet at a drawing temperature of 50°C and a draw ratio of 2.3 to form a porous moisture permeable sheet. The thickness of the moisture permeable sheet was 20 μ m and the amount of moisture permeation was 1.8 g/(100cm²·hr). The basis weight was 20g/m². A gravure printing machine was used to print a crying face character 33 as shown in Fig. 5(b) and a water-insoluble printed section (color:cyan blue) 31 having a pattern 34 of tears on the surface of the skin abutting face of the resulting sheet. After this, a water-soluble printed section (color-cyan blue) 32 was printed with a pattern of stars and a laughing face character so as to partially cover the water-insoluble printed section as shown in Fig. 5(a).

[0054]

(2) Manufacture of the Outer Sheet

A fiber having a fiber length of 45 mm and a fiber diameter of 13 μ m and

having a core-sheath structure formed from a core of polyester and a sheath of high-density polyethylene having a melting temperature of 130°C were used to form a card web having 100% fiber in all layers. The card web was heat processed in a drier for 10 seconds at 132°C for 10 seconds to obtain a non-woven fabric having a basis weight of 20g/m². A commercially available SIS type hot melt adhesive is coated onto the back face of the resulting non-woven fabric and an outer sheet is obtained by binding the non-woven fabric having a basis weight of 18g/m² manufactured using a commercial spun bond manufacturing processing.

[0055]

(3) Manufacture of the Laminate Sheet

A laminate sheet was produced by using a commercially available SIS hotmelt adhesive to bind the outer sheet above in (2) above to the back sheet obtained in (1) above.

[0056]

(4) Manufacture of the Pants-Type Diaper

With the exception of the laminated sheet obtained in (3) above, a pants-type disposable diaper was prepared using normal materials for such a diaper.

[0057]

Embodiment 2

After printing the water-insoluble printed section (color: magenta) 31 having a pattern of musical notes as shown in Fig. 6(b), a water-soluble printed section (color: cyan) 32 was printed to cover the entire water-insoluble printed section 31 as shown in Fig. 6(a),. Apart from the color of the covering section (the intermediate color) being purple, a disposable diaper was prepared in the same manner as Embodiment 1.

[0058]

(Comparative Example)

After printing the water-insoluble printed section (color: cyan) 31 having a pattern in the contour of stars as shown in Fig. 7(a), a water-soluble printed section (color: cyan) 32 was printed in an inner section of the water-insoluble printed section not to be superimposed on the water-insoluble printed section 31. In other respects, a disposable diaper was prepared in the same manner as Embodiment 1.

[0059]

(5) Evaluation of Properties

The resulting backsheet and diaper were evaluated for color difference before and after urine excretion and brightness and color saturation of the printed section after urine excretion, and with respect to change in the pattern or the like and moisture

permeable properties before and after urine excretion using the method below.

[0060]

(Evaluation of Moisture Permeability Properties of Backsheet)

Measurement was performed in accordance with JIS Z0208.

[0061]

Evaluation of the Pattern or the like

A single sheet of filter paper (hard filter paper, ADVANTECT, 4A, ϕ 185mm, Toyo Filter Paper) was placed on the water-soluble printing surface and a pipette was used to drip 0.1 g/cm² of water thereon. After one minute, the wetted filter paper was removed, a new sheet of filter paper was placed on the water-soluble printing surface and on top of the filter paper, a 100mm square acrylic plate was placed with a 1 kg counterweight thereon. After one minute, the filter paper, acrylic plate and counterweight were removed, and the change to the pattern from the back face of the surface provided with the water-soluble pattern was observed with the naked eye and evaluated using the four grades below.

⊙:Change in pattern sharp, visual confirmation extremely good.

○:Change in pattern clear, visual confirmation good.

△:Change in pattern slightly unclear, visual confirmation slightly poor.

×:Change in pattern unclear, visual confirmation poor.

[0062]

Evaluation of Color Difference and Brightness

The L* value, the C* value and the color difference ΔE^*_{ab} value were measured using a portable dispersion color difference meter NF777 (tradename) manufactured by Nihon Denshiki Co., Ltd. The measurement conditions were illumination condition C, view angle condition 2°, illumination light reception condition 0/45° and flux diameter ϕ 10mm. The backsheet (unprinted) was placed on the back of a measurement sample and laminated to have a thickness of at least 5 mm and then reflective light was measured. The measurement field measured L* value, the C* value and the color difference ΔE^*_{ab} only in sections of the pattern of a level of ϕ 5mm.

[0063]

[Table 1]

	L* value before excretion of urine	L* value after excretion of urine	C* value before excretion of urine	C* value after excretion of urine	ΔE^*_{ab} value for color difference before and after excretion of urine	Moisture permeability before excretion of urine *1	Moisture permeability after excretion of urine *1	Change of pattern or the like
Working Example 1	40.1	54.6	36.9	47.2	15.3	1.3	1.5	○
Working Example 2	55.5	69.2	29.1	37.5	38.1	1.5	1.5	⊙
Comparative Example	53.2	93.3	48.7	1.93	87.5	0.5	1.4	○

[0064]

As shown in Table 1, in the backsheet provided with a pattern on which a water-insoluble printed section and a water-soluble printed section are not superimposed as in the comparative example, the surface area of the water-soluble printed section washed away with water must be enlarged in order to enable sufficient confirmation of the change in the pattern by a viewer. To that degree, the moisture permeation properties of the backsheet are adversely affected.

In contrast, a backsheet in which a water-insoluble printed section and a water-soluble printed section are superimposed as in Embodiment 1, and in which the water-soluble printed section pattern are printed with a pattern, letters or symbols from a section covered by the water-soluble printed section in the water-insoluble printed section enables sufficient confirmation of a change in the pattern by a viewer without the moisture permeation properties of the backsheet being adversely affected.

Furthermore, by covering a part or the whole of the water-insoluble printed section as shown in Embodiment 2 with the water-soluble printed section having a color that is different to the color of the water-insoluble printed section, the backsheet is printed with a pattern enabling an intermediate color for the water-insoluble printed section and the water-soluble printed section in the covering section. Thus, more concrete confirmation of the change is possible by a viewer due to the change to the color of the water-insoluble printed section from the intermediate color of the water-insoluble printed section and the water-soluble printed section before and after urine excretion.

[0065]

(Effect of the Invention)

According to the present invention, it is possible to provide a backsheet for an absorbent article and an absorbent article that enables accurate confirmation of the presence or absence of urine excretion and suppresses the printed surface area.

[Brief Description of the Drawings]

Fig. 1 is a partially exploded perspective view schematically showing the use of a first embodiment of an absorbent article according to the present invention.

Fig. 2 schematically shows the main components in a sectional view and an expanded plan view of the above embodiment, wherein (a) is an expanded plan view, and (b) is a sectional view showing the main components.

Fig. 3 schematically shows the change in a printed pattern before and after urine excretion, wherein (a) shows the pattern before urine excretion and (b) shows the

pattern after urine excretion.

Fig. 4 schematically shows a part of the manufacturing process for an absorbent article according to the present invention.

Fig. 5 schematically shows the change in a pattern on a backsheet of a disposable diaper according to a first embodiment of the present invention before and after urine excretion, wherein (a) shows the pattern before urine excretion and (b) shows the pattern after urine excretion.

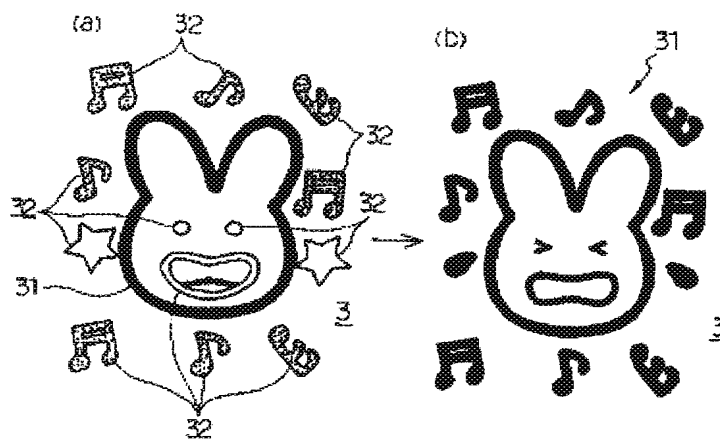
Fig. 6 schematically shows the change in a pattern on a backsheet of a disposable diaper according to a second embodiment of the present invention before and after urine excretion, wherein (a) shows the pattern before urine excretion and (b) shows the pattern after urine excretion.

Fig. 7 schematically shows the change in a pattern on a backsheet of a disposable diaper according to a comparative example before and after urine excretion, wherein (a) shows the pattern before urine excretion and (b) shows the pattern after urine excretion.

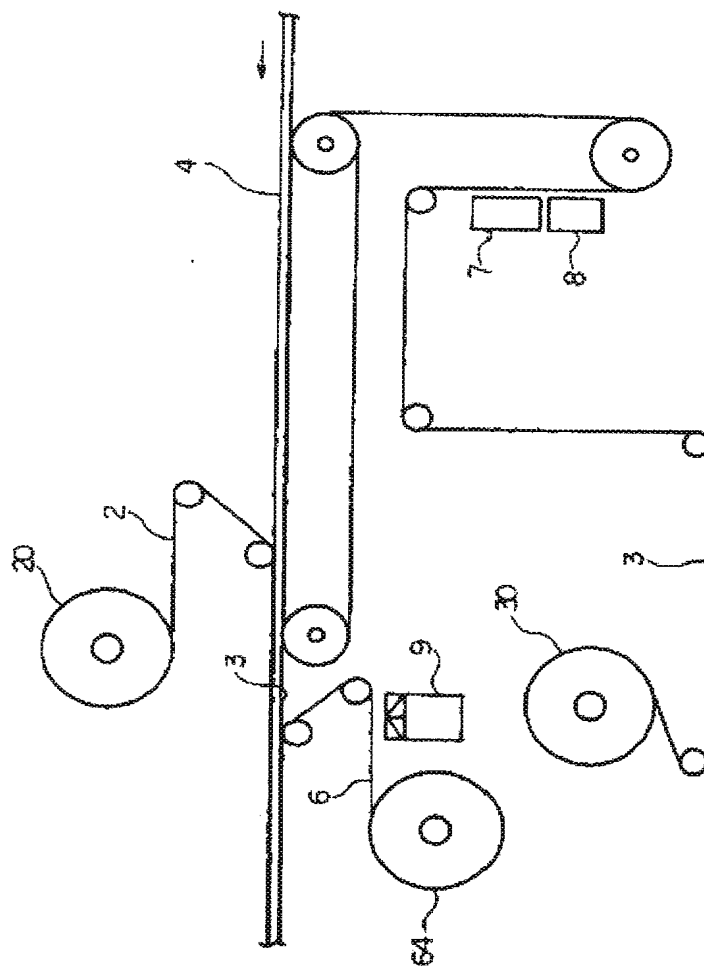
(Reference Numerals)

- 1 disposable diaper (absorbent article)
- 2 top sheet
- 3 back sheet
- 4 absorbent body
- 6 outer sheet
- 31 water-insoluble printed section
- 32 water-soluble printed section

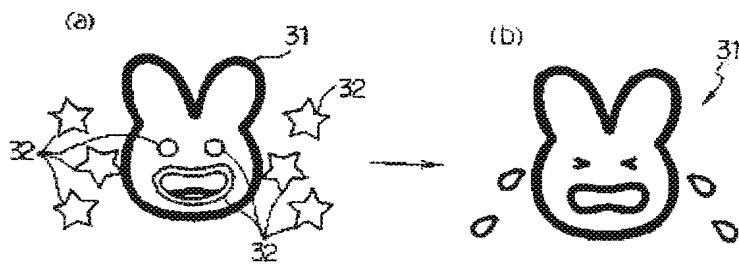
[FIG. 3]



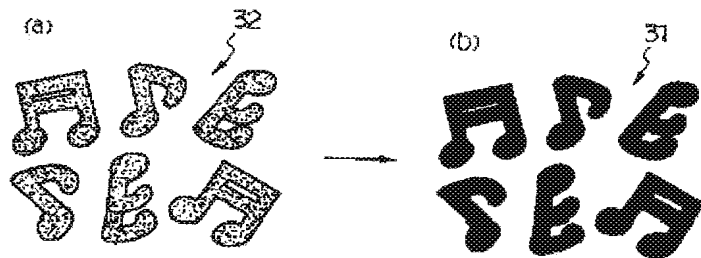
[FIG. 4]



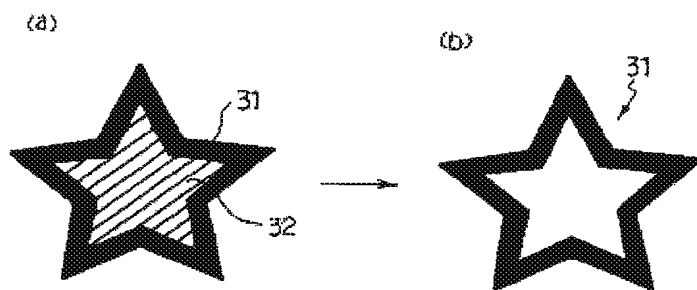
[FIG. 5]



[FIG. 6]



[FIG. 7]



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[Amendment 1]

[Subject of Amendment] Specification

[Item Name of Subject of Amendment] Scope of the Patent Claims

[Amendment Method] Revision

[Details of the Amendment]

[Scope of the Patent Claims]

[Claim 1]

A liquid-impermeable and moisture-permeable backsheet for an absorbent article has a water-insoluble printed section printed with water-insoluble ink and a water-soluble printed section printed with water-soluble ink, wherein a part or the whole of the water-insoluble printed section is covered by the water-soluble printed section.

[Claim 2]

The backsheet for an absorbent article according to claim 1, wherein the water-soluble printed section and the section covered by the water-soluble printed section in the water-insoluble printed section are printed with different letters, symbols or designs.

[Claim 3]

The backsheet for an absorbent article according to claim 1 or claim 2, wherein the water-soluble printed section and the section covered by the water-soluble printed section in the water-insoluble printed section are of different colors.

[Claim 4]

The backsheet according to any one of claims 1 - 3, wherein the water-soluble ink dissolves in urine.

[Claim 5]

The backsheet according to any one of claims 1 - 3, wherein the water-soluble printed section loses coloring in water.

[Claim 6]

An absorbent article provided with a top sheet, a backsheet according to any one of claims 1 - 5 and a liquid-retaining absorbent body disposed between the sheets.

[Claim 7]

The absorbent article according to claim 6, wherein the water-soluble printed section is provided on the contact surface with the skin of the backsheet.

[Revision 2]

[Subject of Amendment] Specification

[Item in Document to be Amended] 0039

[Amendment Method] Revision

[Details of the Amendment]

[0039]

The water-insoluble printed section 31 and the water-soluble printed section 32 may be provided in proximity (the central section of the groin section of the diaper and slightly more towards the abdomen) to the urine excretion spot in the disposable diaper. However, when urine is discharged with force when sleeping with the diaper attached, there is sometimes leakage of urine toward the open section around the torso of the diaper. In order to promptly advise a viewer of the point reached by the urine in this case, as shown in Fig. 2, the water-insoluble printed section 31 and the water-soluble printed section 32 are preferably provided in the abdominal side section and the back section.